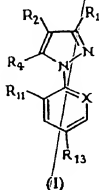


CLAIMS

1. Anti-flea and anti-tick collar or other external device for a pet, in particular a cat or dog, made of a matrix in which is incorporated from 0.1 to 40% by weight, relative to the collar, of a substance which is active against fleas and ticks, this active substance being formed of at least one compound corresponding to formula (I) below:



in which:

$R_1$  is CN or methyl or a halogen atom;

$R_2$  is  $S(O)_n R_3$  or 4,5-dicyanoimidazol-2-yl or haloalkyl;

$R_3$  is alkyl or haloalkyl;

$R_4$  represents a hydrogen or halogen atom; or a radical  $NR_5 R_6$ ,  $S(O)_m R_7$ ,  $C(O)R_7$ ,  $C(O)O-R_7$ , alkyl, haloalkyl or  $OR_8$  or a radical  $-N=C(R_9)(R_{10})$ ;

$R_5$  and  $R_6$  independently represent a hydrogen atom or an alkyl, haloalkyl,  $C(O)alkyl$ , alkoxy carbonyl or  $S(O)_l CF_3$  radical; or  $R_5$  and  $R_6$  may together form a divalent alkylene radical which may be interrupted by one or two divalent hetero atoms, such as oxygen or sulphur;

R, represents an alkyl or haloalkyl radical;

R<sub>8</sub> represents an alkyl or haloalkyl radical or a hydrogen atom;

R<sub>9</sub> represents an alkyl radical or a hydrogen atom;

5 R<sub>10</sub> represents a phenyl or heteroaryl group optionally substituted with one or more halogen atoms or groups such as OH, -O-alkyl, -S-alkyl, cyano or alkyl;

R<sub>11</sub> and R<sub>12</sub> represent, independently of each other, a hydrogen or halogen atom, or CN or NO<sub>2</sub>;

10 R<sub>13</sub> represents a halogen atom or a haloalkyl, haloalkoxy, S(O)<sub>q</sub>CF<sub>3</sub> or SF<sub>5</sub> group;

m, n, q and r represent, independently of each other, an integer equal to 0, 1 or 2;

15 X represents a trivalent nitrogen atom or a radical C-R<sub>12</sub>, the other three valency positions of the carbon atom forming part of the aromatic ring;

with the proviso that when R<sub>1</sub> is methyl, either R<sub>3</sub> is haloalkyl, R<sub>4</sub> is NH<sub>2</sub>, R<sub>11</sub> is Cl, R<sub>13</sub> is CF<sub>3</sub> and X is N; or R<sub>2</sub> is 4,5-dicyanoimidazol-2-yl, R<sub>4</sub> is Cl, R<sub>11</sub> is Cl, R<sub>13</sub> is CF<sub>3</sub> and X is =C-Cl;

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this collar or other external device being designed to ensure more than 6 months of efficacy against fleas and more than 3 months of efficacy against ticks, the efficacy preferably being maintained for several weeks even if the collar or other external device is taken off or lost or if there is a variation in the release of the compound (I) by the matrix.

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2. *The collar* according to claim 1, characterized in that the compound of formula (I) is such that:

30 R<sub>1</sub> is CN or methyl;

R<sub>2</sub> is S(O)<sub>n</sub>R<sub>3</sub>;

R<sub>3</sub> is alkyl or haloalkyl;

R<sub>4</sub> represents a hydrogen or halogen atom; or a

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radical  $\text{NR}_5\text{R}_6$ ,  $\text{S}(\text{O})_n\text{R}_7$ ,  $\text{C}(\text{O})\text{R}_7$ , alkyl, haloalkyl or  $\text{OR}_8$  or a radical  $-\text{N}=\text{C}(\text{R}_9)(\text{R}_{10})$ ;

$\text{R}_5$  and  $\text{R}_6$  independently represent a hydrogen atom or an alkyl, haloalkyl,  $\text{C}(\text{O})\text{alkyl}$  or  $\text{S}(\text{O})_2\text{CF}_3$  radical; or  $\text{R}_5$  and  $\text{R}_6$  may together form a divalent alkylene radical which may be interrupted by one or two divalent hetero atoms, such as oxygen or sulphur;

$\text{R}_7$  represents an alkyl or haloalkyl radical;

$\text{R}_8$  represents an alkyl or haloalkyl radical or a hydrogen atom;

$\text{R}_9$  represents an alkyl radical or a hydrogen atom;

$\text{R}_{10}$  represents a phenyl or heteroaryl group optionally substituted with one or more halogen atoms or groups such as  $\text{OH}$ ,  $-\text{O-alkyl}$ ,  $-\text{S-alkyl}$ , cyano or alkyl;

$\text{R}_{11}$  and  $\text{R}_{12}$  represent, independently of each other, a hydrogen or halogen atom;

$\text{R}_{13}$  represents a halogen atom or a haloalkyl, haloalkoxy,  $\text{S}(\text{O})_2\text{CF}_3$  or  $\text{SF}_5$  group;

$m$ ,  $n$ ,  $q$  and  $r$  represent, independently of each other, an integer equal to 0, 1 or 2;

$\text{X}$  represents a trivalent nitrogen atom or a radical  $\text{C-R}_{12}$ , the other three valency positions of the carbon atom forming part of the aromatic ring;

with the proviso that when  $\text{R}_1$  is methyl, then  $\text{R}_3$  is haloalkyl,  $\text{R}_5$  is  $\text{NH}_2$ ,  $\text{R}_{11}$  is  $\text{Cl}$ ,  $\text{R}_{13}$  is  $\text{CF}_3$  and  $\text{X}$  is  $\text{N}$ .

3. The collar according to claim 2, wherein the compound of formula (I) is such that  $\text{R}_1$  is  $\text{CN}$ .

4. The collar according to claim 2, wherein the compound of formula (I) is such that  $\text{R}_{13}$  is haloalkyl.

5. The collar according to claim 4, wherein the compound of formula (I) is such that  $\text{R}_{13}$  is  $\text{CF}_3$ .

6. The collar according to claim 2, wherein the compound of formula (I) is such that  $\text{R}_2$  is  $\text{S}(\text{O})_n\text{R}_3$ .

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7. Collar according to claim 6, wherein  $n = 1$  and  $R_3$  is chosen among the group consisting of  $CF_3$ , methyl, ethyl.

8. Collar according to claim 6, wherein  $n = 0$  and  $R_3$  is  $CF_3$ .

9. Collar according to claim 2, wherein the compound of formula (I) is such that  $X$  is  $C-R_{12}$ ,  $R_{12}$  being a halogen atom.

10. Collar according to claim 2, wherein the compound of formula (I) is chosen from those in which  $R_1$  is  $CN$ ,  $R_3$  is haloalkyl,  $R_4$  is  $NH_2$ ,  $R_{11}$  and  $R_{12}$  are, independently of each other, a halogen atom, and/or  $R_{13}$  is haloalkyl.

11. Collar according to claim 2, wherein the compound of formula (I) is ~~chosen among the group consisting of~~ compound A:

1-[2,6- $Cl_2$ ,4- $CF_3$ phenyl]3-CN4-[SO- $CF_3$ ]5- $NH_2$ pyrazole

~~and its derivatives with  $n=0$  and  $R_3$  is  $CF_3$ , and  $n=1$  and  $R_3$  is ethyl.~~

12. Collar according to claim 2, wherein the collar comprises from 1 to 15% <sup>by weight agent</sup> active substance.

12. Collar according to claim 2, wherein the collar comprises from 1.25 to 10% <sup>the collar</sup> active substance.

13. Collar according to claim 2, wherein the collar comprises from 2 to 6% <sup>by weight agent</sup> active substance.

14. Collar according to claim 2, wherein the collar comprises from 2.5 to 5% <sup>by weight agent</sup> active substance.

15. Collar according to claim 11, wherein the collar comprises from 1.25 to 10% <sup>by weight agent</sup> active substance.

16. Collar according to claim 11, wherein the collar comprises from 2 to 6% <sup>by weight agent</sup> active substance.

17. Collar according to claim 11, wherein the collar comprises from 2.5 to 5% <sup>by weight agent</sup> active substance.

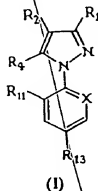
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18. ~~Collar~~ *The collar* according to claim 11, wherein the efficacy is maintained when the collar ~~or external device~~ is taken off or lost, over a period ranging from 2 to 3 months against fleas and from 1 to 2 months against ticks.

19. ~~Collar~~ *The collar* according to claim 11, wherein it comprises a concentration of active substance which ensures effective protection against fleas for a period longer than or equal to 12 or 18 months.

20. ~~Collar~~ *The collar* according to claim 11, wherein it comprises a concentration of active substance which ensures effective protection against ticks for a period longer than or equal to 12 or 15 months.

21. Method for eliminating fleas and ticks from pets, in particular cats and dogs, in which one attaches to the pets at least one collar or other external device which comprises a compound corresponding to formula (I) below:



in which:

R<sub>1</sub> is CN or methyl or a halogen atom;

R<sub>2</sub> is S(O)<sub>n</sub>R<sub>3</sub> or 4,5-dicyanoimidazol-2-yl or haloalkyl;

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$R_3$  is alkyl or haloalkyl;

$R_4$  represents a hydrogen or halogen atom; or a radical  $NR_5R_6$ ,  $S(O)_mR_7$ ,  $C(O)R_7$ ,  $C(O)O-R_7$ , alkyl, haloalkyl or  $OR_8$  or a radical  $-N=C(R_9)(R_{10})$ ;

5  $R_5$  and  $R_6$  independently represent a hydrogen atom or an alkyl, haloalkyl,  $C(O)$ alkyl, alkoxycarbonyl or  $S(O)_2CF_3$  radical; or  $R_5$  and  $R_6$  may together form a divalent alkylene radical which may be interrupted by one or two divalent hetero atoms, such as oxygen or sulphur;

10  $R_7$  represents an alkyl or haloalkyl radical;

$R_8$  represents an alkyl or haloalkyl radical or a hydrogen atom;

$R_9$  represents an alkyl radical or a hydrogen atom;

15  $R_{10}$  represents a phenyl or heteroaryl group optionally substituted with one or more halogen atoms or groups such as OH, -O-alkyl, -S-alkyl, cyano or alkyl;

$R_{11}$  and  $R_{12}$  represent, independently of each other, a hydrogen or halogen atom, or optionally CN or  $NO_2$ ;

20  $R_{13}$  represents a halogen atom or a haloalkyl, haloalkoxy,  $S(O)_qCF_3$  or  $SF_3$  group;

m, n, q and r represent, independently of each other, an integer equal to 0, 1 or 2;

25 X represents a trivalent nitrogen atom or a radical  $C-R_{12}$ , the other three valency positions of the carbon atom forming part of the aromatic ring;

with the proviso that when  $R_1$  is methyl, either  $R_3$  is haloalkyl,  $R_4$  is  $NH_2$ ,  $R_{11}$  is Cl,  $R_{13}$  is  $CF_3$  and X is N; or  $R_2$  is 4,5-dicyanoimidazol-2-yl,  $R_4$  is Cl,  $R_{11}$  is Cl,  $R_{13}$  is  $CF_3$  and X is  $=C-Cl$ ;

30 which method ensuring prevention and treating fleas and ticks to a high degree of efficacy and over a period exceeding 6 months against fleas and 3 months against ticks, the efficacy preferably being maintained over

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several weeks even if the collar or external device is taken off or if there is a variation in the release of the compound (I) by the collar or external device.

22. *The method* Method according to claim 21, wherein the compound of formula (I) is such that:

$R_1$  is CN or methyl;

$R_2$  is  $S(O)_nR_3$ ;

$R_3$  is alkyl or haloalkyl;

10  $R_4$  represents a hydrogen or halogen atom; or a radical  $NR_5R_6$ ,  $S(O)_mR_7$ ,  $C(O)R_7$ , alkyl, haloalkyl or  $OR_8$  or a radical  $-N=C(R_9)(R_{10})$ ;

15  $R_5$  and  $R_6$  independently represent a hydrogen atom or an alkyl, haloalkyl,  $C(O)alkyl$  or  $S(O)_nCF_3$  radical; or  $R_5$  and  $R_6$  may together form a divalent alkylene radical which may be interrupted by one or two divalent hetero atoms, such as oxygen or sulphur;

$R_7$  represents an alkyl or haloalkyl radical;

$R_8$  represents an alkyl or haloalkyl radical or a hydrogen atom;

20  $R_9$  represents an alkyl radical or a hydrogen atom;

$R_{10}$  represents a phenyl or heteroaryl group optionally substituted with one or more halogen atoms or groups such as OH, -O-alkyl, -S-alkyl, cyano or alkyl;

25  $R_{11}$  and  $R_{12}$  represent, independently of each other, a hydrogen or halogen atom;

$R_{13}$  represents a halogen atom or a haloalkyl, haloalkoxy,  $S(O)_qCF_3$  or  $SF_5$  group;

m, n, q and r represent, independently of each other, an integer equal to 0, 1 or 2;

30 X represents a trivalent nitrogen atom or a radical  $C-R_{12}$ , the other three valency positions of the carbon atom forming part of the aromatic ring;

with the proviso that when  $R_1$  is methyl, then  $R_3$  is

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haloalkyl,  $R_4$  is  $NH_2$ ,  $R_{11}$  is Cl,  $R_{13}$  is  $CF_3$  and X is N.

23. ~~The method~~ Method according to claim 22, wherein the compound of formula (I) is such that  $R_1$  is CN.

24. ~~The method~~ Method according to claim 22, wherein the compound of formula (I) is such that  $R_{13}$  is haloalkyl.

25. ~~The method~~ Method according to claim 22, wherein the compound of formula (I) is such that  $R_{13}$  is  $CF_3$ .

26. ~~The method~~ Method according to claims 22, wherein the compound of formula (I) is such that  $R_2$  is  $S(O)_nR_3$ .

27. ~~The method~~ Method according to claim 26, wherein  $n = 1$  and  $R_3$  is chosen among the group consisting of  $CF_3$ , methyl, ethyl.

28. ~~The method~~ Method according to claim 26, wherein  $n = 0$  and  $R_3$  is  $CF_3$ .

29. ~~The method~~ Method according to claim 22, wherein the compound of formula (I) is such that X is  $C-R_{12}$ ,  $R_{12}$  being a halogen atom.

30. ~~The method~~ Method according to claim 22, wherein the compound of formula (I) is such that  $R_1$  is CN,  $R_3$  is haloalkyl,  $R_4$  is  $NH_2$ ,  $R_{11}$  and  $R_{12}$  are, independently of each other, a halogen atom, and/or  $R_{13}$  is haloalkyl.

31. ~~The method~~ Method according to claim 22, wherein the compound of formula (I) is chosen among the group consisting of compound A:

1-[2,6- $Cl_2$ -4- $CF_3$ phenyl]3-CN4-[SO- $CF_3$ ]5- $NH_2$ pyrazole and its derivatives with  $n=0$  and  $R_3$  is  $CF_3$ , and  $n=1$  and  $R_3$  is ethyl.

32. ~~The method~~ Method according to claim 22, wherein the compound of formula (I) is present in a <sup>concentration</sup> proportion of from 1 to 15% by weight.

33. ~~The method~~ Method according to claim 22, wherein the compound of formula (I) is present in a <sup>concentration</sup> proportion of from 1.25 to 10%.

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34. ~~Method~~ <sup>the method</sup> according to claim 22, wherein the compound of formula (I) is present in a ~~proportion~~ <sup>concentration</sup> of from 2 to 6%.

35. ~~Method~~ <sup>the method</sup> according to claim 22, wherein the compound of formula (I) is present in a ~~proportion~~ <sup>concentration</sup> of from 2.5 to 5% by weight.

36. ~~Method~~ <sup>the method</sup> according to claim 31, wherein the compound of formula (I) is present in a ~~proportion~~ <sup>concentration</sup> of from 1.25 to 10%.

37. ~~Method~~ <sup>the method</sup> according to claim 31, wherein the compound of formula (I) is present in a ~~proportion~~ <sup>concentration</sup> of from 2 to 6% by weight.

38. ~~Method~~ <sup>the method</sup> according to claim 31, wherein the compound of formula (I) is present in a ~~proportion~~ <sup>concentration</sup> of from 2.5 to 5% by weight.

39. Method according to claim 31, wherein the efficacy is greater than 95% against fleas.

40. ~~Method~~ <sup>the method</sup> according to claim 31, wherein the efficacy is greater than 98% or 99% against fleas.

41. ~~Method~~ <sup>the method</sup> according to claim 31, wherein the efficacy is greater than 80% against ticks.

42. ~~Method~~ <sup>the method</sup> according to claim 31, wherein the efficacy is greater than 90% against ticks.

43. ~~Method~~ <sup>the method</sup> according to claim 31, wherein the ~~long-~~ lasting efficacy is longer than or equal to 12 months against fleas.

44. ~~Method~~ <sup>the method</sup> according to claim 31, wherein the long-lasting efficacy is longer than or equal to 18 months against fleas.

45. ~~Method~~ <sup>the method</sup> according to claim 31, wherein the ~~long-~~ lasting efficacy is longer than or equal to 12 months against ticks.

46. ~~Method~~ <sup>the method</sup> according to claim 31, wherein the long-

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~~lasting~~ efficacy is longer than or equal to 15 months against ticks.

47. ~~Method~~ <sup>The method</sup> according to claim 31, wherein the efficacy is maintained when the ~~collar or~~ external device is taken off or lost, over a period ranging from 2 to 3 months against fleas and from 1 to 2 months against ticks.

add a1  
add a2  
add c3  
add d1  
add e

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